Modelling in natural resource management – Kenya coastal fisheries

Dissemination Workshop Report

Ecosystem Services for Poverty Alleviation (ESPA) projects
Whole Decision Network Analysis for Coastal Ecosystems (WD-NACE)
in coastal Kenya

Millennium, Hotel Ukunda
September 2012

David Obura, Stephen Oluoch & Khyria Swaleh

Table of Contents

1. Introduction

The Whole Decision Network Analysis for Coastal Ecosystems (WD-NACE) project involved partners from the United Kingdom, Bangladesh and Kenya. It builds upon existing knowledge in those regions working with local teams, connecting with policy makers, practitioners, and poor men and women who directly depend on the ecosystem resources to develop conceptual representative tools and models. The intervention was intended to provide decision takers with understanding of both local stakeholder and scientific perceptions of critical elements regarding the use of coastal ecosystem services and of the complex interrelationship between them. The models developed will encapsulate the role of knowledge; how individuals filter knowledge according to their social norms and organizational commitments; plural and competing narratives; the role of boundary actors in knowledge networks; and, finally, what kind of governance allows for constructive learning and collective action to control, adapt, learn and innovate within ecosystem limits.

The project further looked at governance, power and knowledge structures and how they influence behaviour, actions and decision taking for sustainable ecosystems. Specifically, it focused on the idea of using social-ecological systems to understand better how ecosystems can be managed. This coupling related to how knowledge is produced and gets filtered and repackaged for decision-making. Different patterns of knowledge production, use and circulation – which can be related to dominant belief systems (norms) – have different implications for resource management. Put simply, knowledge may exist on its own but to use that knowledge involves power: thus to understand the system we need to understand not only knowledge but also the power relationships between people who invoke knowledge and use it.

An Agent-Based Model of a Beach Management Unit (BMU) was one of the primary outputs of the project, to explore the possibilities of using such an approach to codify the governance and power relationships that affect fishing effort, and the individual decisions that fishers must take in their day to day activities. A pilot version of the model was shown to the participants, for them to explore its dynamics, and comment on how well it matches their experience. The model was used as a dissemination tool, and to explore how it reveals issues through discussion and feedback among participants.

As the final activity in this project, a feedback workshop was held in Ukunda, on the south coast of Kenya, on 20th and 21st September 2012. The purpose of these feedbacks was to report and give Beach Management Unit leaders and coastal communities some feedback and discussion points that could be incorporated into the model to make it better and to decide whether such a model could be applied at the individual Beach Management Units

1.1. Opening remarks

The meetings were called to order at 9.30 am with a word of prayer from the participants followed by self-introduction. The officers from Fisheries Department and Kenya Wildlife Service in Msambweni and Shimoni respectively welcomed the participants and thanked CORDIO for organizing the dissemination workshop. They asked the participants to use the opportunity to shared their experiences with the researchers so that their input could be used to improve the model

1.2. Workshop Objectives

The objectives were to;

i. Feedback and disseminate to the BMU members and partners key BMU model research results
ii. Introduce the BMU agent-based model to the majority of the BMU member who had not had the chance to participate in the project
iii. Gather feedback from the participants that would help enrich the model in future applications.

1.3. Description of the project

A presentation entitled "***Understanding decision networks in coastal resource management A conceptual framework*"** giving a summary of project activities done in both Kenya and Bangladesh from 2010-2012 was shared and discussed by the participants, these included organization of a series of workshops, field visits to the BMUs and other community based organizations were organized for the purpose of data collection and verification. An example of a BMU model for fishers and simple Model of Shrimp and Paddy farmers in South West Bangladesh was presented to the participants, to have a feeling of the models. Another short presentation was on the "**lives and livelihoods of communities living in the Sundarbans Ecosystem: South-West Bangladesh** was given to show the participants the similarities and differences in the ecosystem services and challenges of natural resource Management in the areas"

1.4. Key highlights from the presentations and comments from the plenary

The idea that Beach Management Units (BMUs) have led to an improvement in governance at the landing site level and contributed towards improvement in fish catch generated a lot of discussions. The perception of the fishers was that increase in fish catch is not directly as a result of the establishment of Beach Management Units (BMUs), while it is true that BMUs have had varied success in managing landing sites and controlling of illegal fishing activities.

Majority felt that full control has not been achieved due to inadequate capacity building and lack of an effective BMU network. Consequently, some of the key tasks such as data collection have been compromised over revenue collection leading to unreliable data. Reliable fish catch data can only be collected from the BMUs by constantly training BMUs on data collection and basic analysis. Further, the fishers felt that the fish catch data collection templates should be

harmonized for all the coastal BMUs to enable easy comparison. This will lead to an improvement in data collection and enable comparison of catch trends among BMUs upon which a realistic model can be developed.

Fishers inquired about the possibilities of engaging in alternative livelihood activities such as shrimp farming like in the case of Bangladesh. The interest in shrimp farming was driven by the fact that fish catch rates have declined and the number of new entrants in to fishery is increasing. Therefore, there is need for researchers to conduct a feasibility study and marketing strategy for shrimp farming and an alternative should be sought to engage in shrimp, which can be supported through the Kenya Coastal Development Project (KCDP)

The participants felt that most of the research conducted among the BMUs does not directly benefit local communities. Despite the existence of BMUs, most of the research is still done independently without the involvement of the local communities and lack of feedback. Some fishers perceive that the BMUs are being used as a scheme to benefit individuals. In addition, they faulted the Ministry of Fisheries for its lack of concern to rein in institutions that are claiming to train BMUs, yet capacities still remain low despite the colossal amount spent. They proposed the need for regular feedback, awareness on the mandate of institutions and strengthening of BMU networks.
The reaction from Ministry of Fisheries was that, through Co-management approach BMUs have the legal mandate to manage their resources under their jurisdiction. Therefore, they should be more actively involved in restricting the use of destructive fishing gears through the enforcement of their by-laws. However, most of the BMUs have allowed the continued use of illegal fishing gears because of the landing fee collected from such operations. This has generated conflicts between BMUs and among the different fishers using traditional gears. The BMU network through its leadership has the mandate to solve some of these conflicts but have taken a back seat due to internal wrangles.

Kenya Wildlife Service (KWS) also emphasized the need to have a strong BMU network as it's only through this that coordinated surveillance can be conducted with the assistance of the government institutions. The BMU should be able to provide the right information that the KWS and FiD can act on. Through the concerted efforts between the BMUs and KWS, dynamite fishing (a destructive fishing method) in the Kisite-Mpunguti Marine Park and Reserve has been significantly reduced.

These efforts have been rewarded by KWS through its corporate and social responsibility in which registered groups within BMUs in the South Coast have been supported with fishing boats. However, because of the internal rifts and poor leadership, most of these vessels are no longer functional. The biggest challenge for BMUs leadership and participation in curtailing of illegal fishing gears is kinship ties.

The general view of the participants was that by strengthening BMU networks some of these challenges can be addressed. Despite the existence of a national BMU network, the Coastal region network has lagged behind due to a number of reasons including;

- BMU leaders don't fully understand their roles.
- Inadequate training on BMU leadership.
- Conflicts among different BMU leadership.
- Poor coordination and lack of information among government agencies and NGOs operating in the area.
- BMUs were poorly initiated.

Suggested solutions include;

- Meetings should be organized to bring top leaders instead of bringing members who do not make decisions.
- BMU leadership is a voluntary activity and as such, the leaders should take up the initiative instead of waiting for Fisheries Department to act.
- The training offered by the NGOs should be harmonized to build up on previous trainings instead of each institution having its own

2. Dissemination using the Agent-Based BMU Model

2.1. The importance of local participation in sharing and validation of the Model

A representative from Mombasa County BMU network and chair of Bamburi Beach Management unit Emanuel Yaa shared his experiences with the development of the model with participants. He practically demonstrated to the participants the actual models used in WD-NACE approach with inputs from the UK modelers. He emphasized that for research to be practical there is need to involve the local participation at all levels to increase the community's acceptance and adoption of the output. The BMU representative involved in the model construction appreciated his involvement in the process since its inception. He challenged the fisher communities to show interest in research as is only through this that their capacity to manage their resources will be enhanced. He warned against the prevailing attitude among fishers of misinforming researchers to avoid fishers that emphasized the need to involve local communities in research and encouraged the participants to cooperate in giving accurate information. This information can be used to sustainably manage natural resources holistically.

2.2. Modelling demonstration and group activities

The net logo model and interface was first introduced to the participants with explanation on the various tabs. Thereafter, a scenario was run as the participants made observation and noted the activities taking place. It was explained that the numbers behind the model are not based on real data, so the trial runs represent a 'game' situation, though participants were encouraged to interpret the model runs based on their own experience. Scenarios were run for 10 days and the results presented in plenary for discussion.

The participants were divided into four groups each discussing a scenario in a BMU of their choice. For all the groups the initial stock available for the fishery was 750 of fish with each group allocating the gears and vessels available for that specific BMU. The results and observations are summarised in table 1.

2.3. Discussions on the scenario outputs

Despite the initial perception that models are complicated, the participants were able to interact well with the model and share their views based on the discussions and model outputs. The participants felt that to a large extent the model scenario reflected the reality in the BMUs. Therefore, there will be benefit in parametrizing the models with real data collected from the BMUs. By this the BMUs collecting correct data could use the model to understand the status of their fishery and come up with management recommendations and reduce reliance on the Fisheries Department for support

In addition, the participants also observed that similar to the model, most of the fisher's fish inshore thereby straining the available resources. They stated that the current data collected by the FiDs does not represent the correct figures; most fishers still land their catch without giving information about it. There were suggestions that there should be training and investment in deep-sea fishery to exploit the deep-sea fishery that remains largely unexploited as shown in the model.

Ring net fishery was extensively discussed as a major cause of fish stock depletion and conflict, though some BMUs do not see it as a problem due to the high catches and fishing effort (fishing day and night) associated with it. On average the landings from a ring net fishery estimated to be about 200 kg. The equivalent vessel in the model is the "engine boat", and scenarios with more of these vessels did show stronger depletion of fish (Table 1).

Group Discussions –Beach Management Unit model

Table 1

Day	Groups	Scenarios			Observations
Day 1	Mwaembe BMU	Fishing gears	Vessels/Methods	Vessels no	Based on the participants discussions the fish would be depleted within the 10 days period. However, when the same scenario was run, the results were different from the expected output showing an increase from the initial amount of fish (750 - 1812).
		Basket trap	Dugout canoe	30	
		Spear gun	Swimming	0	
		Gill net	Dugout canoe	6	
		Fishing line	Sail boat	7	
		Ring net	Motor boat	1	
	Kibuyuni BMU	Basket trap	Dugout canoe		The output from the model matched the participants result expectations. In both scenarios, the initial fish stock allocated (750) was depleted within 10 days.
		Spear gun	Sail boat		
		Gill net	Dugout canoe		
		Fishing line	Sail boat		
		Harpoon	Sail boat		
	Mkunguni BMU	Basket trap	Dugout	30	The participants felt that the fish would be depleted within the 10 days. The same scenario was run and the results indicated a decline in fish stock from the initial allocation of 750 to 329.
		Spear gun	Swimming	0	
		Gill net	Engine boat	1	
		Gillnet passive	Engine boat	1	
		Hand line	Sail boat	17	
Day 2	Shimoni BMU	Basket trap	Dugout	61	The participants felt that the fish would be depleted within the 10 days. When the same scenario was run, the results indicated a decrease in fish catch from 750 to 274. Based on the existing scenario of Shimoni BMU, the participants felt that the fish would be depleted within the 10 days. In both scenarios, the initial fish stock allocated (750) was depleted within 10 days
		Spear gun	Swimming	8	
		Gill net	Sail boat	7	
		Fishing line	Engine boat		
		Long line	Engine boat	6	
		Reef net			
		Fence trap			
		Monofilament			
		Beach seine			
		Ring net			

		Mosquito net			
	Vanga BMU	Basket trap	Dugout	66	Based on the existing scenario of Vanga BMU, the participants felt that the fish would be depleted within the 10 days. However, when the same scenario was run, the results were different from the expected output showing a reduction from the initial amount of fish (750 - 127).
		Speargun	Swimming	0	
		Gill net	Sail Boat	26	
		Fishing line	Engine boat	12	
		Long line			
		Basket trap			
		Fence trap			
		Gill net			
		Beach seine			
		Ringnet			

Wasini BMU has set aside protected areas (Tengefu) where fishers are not allowed to fish. For those found infringing the ban, their gears and vessels are confiscated, a report is made to the fisheries detailing gear used and time then the BMU waits for action from the department. The BMU also conserves coral and does not allow trampling on corals by tourists. The BMU chair from Wasini emphasized the need to strengthen their network; this would help them solve problems without going to court unless it's necessary. The project team asked the BMUs if most of the issues touching on the ring net would be handled by the management plan currently under development. It was observed that most fishers use artisanal gears hence the low catch, this could be best handled when the fishers have modern fishing vessels to explore the open sea, and this will lead to an increase in landings.

The community practice both fishing and farming. Farming is done mainly during southeast monsoon, though some go farming in the afternoons, after fishing. Many fishers stated they would like to spend less time fishing, so promotion of farming could reduce fishing effort.

2.4. Comments on the model

Participants were asked to recommend changes in the model, and comment on aspects of its use: Some aspects that needed to be Included in the model

i. Those who fish crabs within mangrove areas.
ii. Day *versus* night fishing not incorporated.
iii. Which gear is used where – inshore/offshore
iv. Include other fisheries (e.g. prawns, crabs, cucumber) apart from fin-fish fishery.
v. Include other economic activities like farming
vi. The model should be BMU/site specific.
vii. Show breeding area, MPA/protected areas to serve as an education/ awareness material to improve conservation.

Additional general comments were made:

- The model is important since it can be used to predict status of the resource and make management decisions.
- Fishers wanted to know where the model has been applied and if the fish stock got depleted?
- Fishermen should be able to access information on data collection and marketing through mobile phones.
- BMUs lack computers, are not trained. Empower especially beach seiners to use e.g. alternative fishing methods.
- Fishermen should be able to use GPS to locate fish.
- Increased awareness on conservation issues such as importance of mangroves, climate change and illegal fishing gears and impact of increased human population on natural resources.
- There is need for sensitization amongst fishers to access market information and micro-finance to explore alternative livelihood activities apart from fishing.

3. Conclusion and Recommendations from fishers

- The model gives ideas on how there should be tradeoffs depending on how decisions should be made.
- Train fishermen on how to collect and manage data. This can build on an ongoing Smart fish project being run by CORDIO, on BMU training – sensitization ongoing on daily data collection/management.
- BMUs should collect data
- Participants agree that BMUs can adopt the model though materials (computers) and training are lacking.
- Share reports on the work done such that they can report to their members.
- Why most organizations insist on fishery? Why not ecotourism? – Model is used for fisheries. Other projects have been involved in other areas e.g. youth, agriculture, women groups, computers and other alternative income activities.

3.1. Comments from Fisheries Department and Kenya Wildlife Service

- Fisheries Department– Why focuses on fisheries in BMUs? Diversify income-generating livelihoods. BMUs should look for ways to adopt the model. Not to depend on FiD, but drive the process themselves. BMU officials should look for funds by reviving BMU networks.
- Communities should take initiative and not depend on government.
- Participants should disseminate the information acquired to their members after attending workshops.
- Follow by-laws, have networks with other stakeholders
- Gender representation in meetings should be taken care of
- KWS–Enforce regulations (by-laws) we have set up and asking for support (conservation and security).

3.2. Closing remarks

The Fisheries officer thanked all the participants for attending the workshop and CORDIO for organizing the meeting. He urged the participants to complete working on their BMU bylaws and to stop complaining about the department or Kenya Wildlife Service for not supporting them to contain illegal fishing activities going on at their landing sites. He encouraged those BMUs which have access to try out the models, so that they could made individual decisions regarding resources within their jurisdiction. The same sentiments were echoed by the KWS warden who said that they are keen to continue supporting the registered BMUs along the coastline but they should take the lead in the decisions.

4. Annexes

A workshop of Ecosystem Services for Poverty Alleviation (ESPA) s
Whole Decision Network Analysis for Coastal Ecosystems (WD-NACE)
in coastal Kenya

Dissemination & feedback Workshop, South Coast-Kenya

Millennium, Hotel Ukunda
September 2012

Annex-1: Workshop program

8:30 – 9:00	**Registration**
9:00 – 9:30	**Opening** • Welcome and introductions • Programme and Objectives
9:30 – 10:30	**Project overviews** • Presentation on WD-NACE–Kenya/Bangladesh • Models/scenarios (The importance of local participation sharing & validation of the Model)
10:30 – 11:00	***Tea/coffee break***
11:00 – 13:00	**Modelling demonstrations/practical's** • Group Discussions –BMU model • Plenary group presentation & discussions of results based on scenarios
13:00 – 14:00	***Lunch break***
14:00 – 16:00	• Run practical computer scenarios with each of the groups i. Discussion of scenarios by groups/results (note taking) ii. management questions & decisions in relation to scenarios iii. Assessment of the approaches, recommendations **Next steps – BMUs learning and applying the models**
16:00 – 16:30	***Closing, with Tea/coffee***

Annex 2: List of participants

	Name	Title	Institution
1	Bakari Mohamed Mchinga	Secretary	BMU Mwaembe
2	Mohamed Masudi Hamza	Chairman	BMU Munje
3	Mohamed Hassan Jasho	Chairman	BMU Kibuyuni
4	Hamisi Mwachikuzi	Chairman	DCMT
5	Ramadhan H. Tungu	Chairman	BMU Mwaepe
6	Juma M. Mwarandani	Member	BMU Chale
7	Mwichambi Kai	Chairman	Jimbo BMU
8	Rashid Said Yusuf	Member	Jimbo BMU
9	Harith Mohamed	Chairman	Vanga BMU
10	Hassan S. Rengwa	Secretary	Munje BMU
11	Rishad Iki Hamisi	Chairman	Shimoni BMU
12	Rama K. Kalama	MoSPND Vision 2030	Msambweni
13	Omondi M. Agengo	Eco-Ethics International	Mombasa
14	Asha Nelson	Ngombeni Youth Dev. group	Mombasa
15	Emmanuel Kahindi Yaa	Chairman	Bamburi BMU
16	Salim Sadik	chairman	Gazi BMU
17	Ntindi Kassim	Researcher	KWS
18	Said Mohamed	Tiwi Massive youth group	Tiwi
19	Majaliwa Salim Mwarora	Secretary	Mwandamo BMU
20	Mwangare Suleiman	Fisheries Officer	Fisheries Dept
21	Omar Abdallah Juma	Chairman	Wasini BMU
22	Muhidini Musa Hamisi	Member	Wasini BMU
23	Bakari J. Kitole	Fish trader	Mkunguni BMU
24	Mesaidi Fadhili	Vice Chairman	Vanga BMU
25	Yahya Abubakar Zakaria	Member	Vanga BMU
26	Sadik Hassan Tondwe	Secretary	Mkunguni BMU
26	Paul Njoroge	Cpl	KWS
27	Paul Tuda	Research Officer	MCTA
28	Victor Mwakha	Research Officer	KEMFRI
29	Khyria Swaleh	Research Officer	KEMFRI
30	Stephen Oluoch	Research Officer	CORDIO